

Solar PVs



How do solar panels work?

Solar electricity panels, also known as photovoltaics (PV), capture the sun's energy and convert it into electricity that you can use in your building.

By installing solar panels, you can generate your own renewable electricity.

How do solar panels work?

A solar PV panel consists of many cells made from layers of semi-conducting material, most commonly silicon. When light shines on this material, a flow of electricity is created.

The cells don't need direct sunlight to work and can even work on cloudy days. However, the stronger the sunshine, the more electricity generated.

Solar PV systems are made up of several panels, with each panel typically generating around 400W of power in strong sunlight in the form of direct current (DC) electricity. Because the electricity used for appliances is alternating current (AC), an inverter is installed along with the system to convert DC electricity to AC. This electricity can be used throughout the building or exported to the grid.

A small 3.5kWp solar PV system, such as you might see on the roof of a house, will take up around 20m² of roof space, which is the same as about two car parking spaces. It would typically be made up from around 15 panels and would generate around 2,500kWh per year, depending on location and system design.

Are solar panels right for your building?

Solar panels can be designed to fit the space you have, accommodating chimneys and unusual roof shapes. A south-facing pitched roof is ideal for generating the most electricity from the sun, but panels facing east or west can also work well. Panels can also be mounted on frames on a flat roof, but north-facing pitched roofs aren't recommended. Consider whether your roof is shaded by any nearby buildings, trees or chimneys, as this will reduce the performance of your system. Limiting the impact of shading will be a key concern for your installer. Sometimes shading is unavoidable and, in this case, your installer may suggest a number of solutions to maximise output from your given space.

PV cells are most effective in bright sunlight but they can still produce some power in the UK on cloudy days. A PV system may be sized to produce as much electricity over the years as is used on site, but often the size is determined by the roof space available, the maximum you are allowed to export to the local network, and the budget available. New-build sites are ideal for PV installations because the cost of fitting them during construction is less than the cost of fitting them at a later stage. However, retrofitting panels to existing buildings can also be a cost-effective option. The building must first be surveyed to ensure that it is able to take the additional weight, and there will often be additional costs such as scaffolding which may not be required in a newbuild project.

Do I need permission to install solar PV?

Planning permission is not usually required for small-scale PV installations (less than 50 kWp). However, there are exceptions (for example, on listed buildings, buildings in conservation areas or national parks). Larger systems up to one megawatt may also be considered permitted development but additional criteria apply. You should always contact your local planning authority for advice before proceeding.

When you connect a PV system to the electrical circuit in a building you are effectively connecting it to the wider electricity network. The local Distribution Network Operator (DNO) will need to be informed of the installation and, in many cases, will need to decide whether the installation can go ahead without any upgrades to the network infrastructure. Domestic scale installations can usually proceed without asking for consent but the DNO should be informed once the system is up and running. If the installation is larger then you will need consent from the DNO before you go ahead. The size at which you need consent will depend on the nature of the existing supply (single phase or three phase) and the details of the solar installation. Your installer will be able to advise on the best approach, liaise with the DNO on your behalf, and may suggest possible mitigation strategies if the DNO does not consent to the initial proposal.

You should also check with your insurance provider to make sure your policy covers your solar PV system or to make any adjustments needed. It's good to get confirmation of this in writing.

Benefits of solar electricity for your building

1. Cut your electricity bills.

Many of us are looking for ways to save on energy bills, and solar panels can help achieve this by using the sun's free energy. Once you've covered the upfront cost of installing solar panels, you can enjoy cheaper bills for years to come.

2. Cut your carbon footprint.

Solar panels are a great way to cut your organisation's carbon footprint and improve your building's energy efficiency rating.

3. Little maintenance

Solar PV systems need little maintenance – a wash once in a while, debris removal if needed and electrical checks of the panels and the inverter.

4. Get payments for the extra energy you generate.

It's likely there will be times when the electricity you generate is more than you can use, so the surplus will be exported to the grid. You can be paid for the electricity you send to the grid through a Smart Export Guarantee (SEG) tariff. To qualify, the work must be suitably certified – for installations up to 50kW this is normally done by providing a copy of your Microgeneration Certification Scheme (MCS) certificate. You will have one of these provided the installation is carried out by an MCS-certified installer (See here (link to section 7) for more information on MCS certification and a list of certified installers in your area).

Many suppliers offer more than one option for buying your surplus generation, and some of the tariffs they offer may be SEGs while others are not. Some tariffs offer a flat rate throughout the day while others will pay you different rates at different times of day. Usually the times and rates are fixed and you get similar multiple rates for the electricity you import. At least one company offers a tariff that has a different rate for export, and for import, every half hour of every day, based on the wholesale price for electricity at that time.

The best tariff for you will depend on how much electricity you use and generate, when you use or generate it, and whether you have any energy storage (link) or large electrical loads that can be operated at different times to suit the tariff structure.

5. Solar panels can improve the EPC of your building.

EPCs tell you how energy efficient your building is and give it a rating from A (very efficient) to G (inefficient). EPCs also inform the person using the building how costly it is likely to be to heat /power, and what carbon dioxide emissions there will be. They also state the potential energy efficiency rating if improvements are made, and highlights cost effective ways to achieve this. The more energy efficient a property is, the less it will cost to heat and light. Also, energy efficient properties have lower carbon emissions, so it's good for your budget and for the planet!

Installing solar PV can improve your property's EPC rating and once you've paid for installation, your energy costs and carbon emissions will be significantly reduced.

Indicative costs and savings

Installation costs

The cost of a solar PV installation can vary significantly depending on the mounting requirements, access issues, and any electrical upgrade requirements, as well as the size of the system.

A typical small-scale UK installation of 3.5kWp, mounted on a pitched roof, will cost around £7,000. This cost includes:

- The inverter, generation meter, panel-mounting system and wiring.
- The cost of labour for supplying, installing, connecting and registering the system.
- Scaffolding, which is needed for most pitched roof mounted systems.

Larger systems are usually less expensive per installed kilowatt.

Ground mounted or flat roof mounted systems will typically cost more as the cost of the mounting system is likely to outweigh any savings through needing scaffolding.

Costs can vary also between installers and products, so we recommend getting quotes from at least three different installers.

Financial savings

The typical energy bill savings of a solar PV system differ depending on the size of the system you need or can accommodate, how much electricity you need daily, when you use it and what you pay for your electricity.

With the recent increase in the cost of electricity, the payback period for solar PVs has become considerably shorter, which can make installing solar PV a smart long-term financial investment. Payback periods can be less than 10 years in many cases. The PV panels should typically last around 40 years. Inverters will not last that long but many will come with a 10 year guarantee.

How long does it take to install solar panels?

Installation can take from one up to several weeks, depending on a number of different factors such as the size of your system, as smaller installations take less time to complete than larger ones, and the type of your roof and its complexity, as installations on flat roofs tend to be quicker than those on pitched roofs.

Disruption during the installation

For the most part, solar PVs can be installed on your building with minimal disruption and your organisation can continue its activities throughout the duration of the installation. Some or all of the electrical supply will need to be disconnected for a short time but this can often be arranged to avoid conflicting with your work practices. You may need to allocate some areas of your building for the storage of solar equipment and other tools and machinery, and ensure there is space for installer vehicle parking and scaffolding, if required.

Can I do this by myself?

Solar panels are not a technology that you can install by yourself. You will need to talk to an installer who will assess your needs and evaluate your building before proposing which system could be right for you. [Click here to learn more about this.](#) (link to installers section)